

CHEMICAL EXPOSURES

Will DEA Findings Wash?

A common soap and shampoo ingredient restricted in Europe for its suspected link to cancer is raising new concerns as study results suggest it can thwart brain development in mice. Researchers at the University of North Carolina at Chapel Hill reported in the August 2006 *FASEB Journal* that diethanolamine (DEA) irreversibly damaged the memory capacity of animals exposed before birth.

Author Steven Zeisel believes DEA could induce fetal neural abnormalities in humans, too. “It’s hard to estimate human exposure, but we believe the mice had exposures about ten times higher,” he says, assuming that people bathe and shampoo daily with DEA-containing products, and use DEA-containing sunscreen. “There’s no reason to believe we wouldn’t see similar effects in humans.” The authors note, however, that dermal absorption of DEA is less efficient in humans than in rats. Further, most DEA used in personal care products is conjugated with fatty acids, which may not have the same effects as just DEA.

Procter & Gamble principal scientist Tim Long calls Zeisel’s estimates of human exposure “grossly inaccurate,” saying that exposures from consumer product uses are actually thousands of times lower. John Bailey, executive vice president for science at the Cosmetic, Toiletry, and Fragrance Association, points out that “when you look at the exposure [of] humans, [you must take] into account the ability of the skin to protect against exposure and the fact that shampoos are rinsed off.”

DEA and its condensates are used as foaming agents in many personal products. According to the public education group known as the Cancer Prevention Coalition, DEA by itself is not harmful, but it can combine with other ingredients in cosmetics to form *N*-nitrosodiethanolamine, which the National Toxicology Program (NTP) has deemed reasonably anticipated to be a human carcinogen. According to the International Agency for Research on Cancer, levels of *N*-nitrosodiethanolamine in personal care products have declined substantially since the 1980s.

DEA first drew attention a decade ago, when animal studies suggested it might be carcinogenic. Both the International Agency for Research on Cancer and the NTP have considered listing it as a carcinogen, but ultimately decided there was too little evidence of human carcinogenicity. The more cautious European Union opted to limit the concentration of DEA allowed in personal care products sold there to 1%. In his article, Zeisel cited a 2002 NTP report stating that products sold in the United States may contain up to 25% DEA, although Bailey claims U.S. products contain 1% or less.

Zeisel and his colleagues exposed fetal mice by painting DEA dissolved in ethanol on a shaven patch of their mothers’ skin for 11 days. DEA inhibited cell development and increased cell apoptosis in the hippocampus of

the fetal mice. Zeisel says such abnormalities would permanently impair the mice’s memory.

Zeisel acknowledges that even if effects are similar in humans, most babies exposed to DEA before birth would probably escape ill effects, though others may be more vulnerable to harm.

He bases this belief on his 10-year studies of the nutrient choline. The body uses choline to produce acetylcholine. Zeisel and his colleagues found that adequate choline is crucial for fetal brain development. They also discovered that individuals’ choline needs vary. In a study published in the July 2006 *FASEB Journal*, the investigators found that some human subjects placed on a choline-deficient diet quickly suffered liver and muscle dysfunction, while others did not. They traced the effects to a genetic poly-

morphism that raises people’s choline requirements. Zeisel says most men and about half of women carry this inherited trait. Because the DEA molecule is similar to choline, Zeisel speculated it could perturb choline metabolism and cause the same effects as choline deficiency.

“We’re not saying mothers shouldn’t shampoo their hair or use sunscreen during pregnancy,” he says. “Just look at the label. Plenty of products don’t use DEA.”

—Cynthia Washam



Lotion notion. New data suggest more study is needed on dermal absorption of DEA by pregnant women.

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REPRODUCTIVE TOXICITY

New Take on Perchlorate Effects

Perchlorate, an ingredient in solid rocket fuel, is known to affect thyroid function by blocking iodine uptake, disrupting physical growth and neurological development. A new fish study in the August 2006 issue of *Environmental Toxicology and Chemistry* indicates that perchlorate may also disrupt sexual development by overmasculinizing both males and females.

In the multiyear project, Richard Bernhardt, a graduate student at the University of Alaska Anchorage, and two colleagues caught wild three-spine sticklebacks, a tiny fish species often used in toxicology. For three weeks they kept the fish in water treated with 30, 60, or 100 ppm perchlorate. After the adults spawned, the scientists raised the offspring to maturity in similarly treated water.

At least half of the offspring in all the treatment groups and more than 70% of those in the highest treatment group died. Many of the surviving male offspring in all treatment groups failed to develop "nuptial coloration" (bright blue and red colors that signal they are ready for spawning), ignored females, and displayed no courtship behaviors such as nest building or attentiveness to prospective mates. Three fish looked and behaved like males but became ripe with eggs; these fish turned out to be genetically female. Cellular analysis of the genetic females' gonads revealed that the organs developed as a mixture of egg-producing and sperm-producing tissues ("ovotestes"). Genetically male fish also developed abnormally large testes. All of the treated fish grew more slowly than untreated controls.

"We saw reproductive effects because we treated the fish during critical developmental windows after conception and analyzed the fish for reproductive effects after they reached sexual maturity," says

Bernhardt. The mechanisms that produced these effects remain unclear.

Biologist Helen Jordinson (née Crane) of the Environment Agency in England and Wales reported in the April 2005 issue of *EHP* that perchlorate exposure delayed growth in fathead minnows exposed for 28 days from embryos. "The [Bernhardt et al.] paper is very interesting," she says, though she urges caution in interpreting the findings. "Significant toxicity was also reported at the same perchlorate concentrations as the behavioral and pathological effects," she explains, which could indicate that effects resulted from the overall stress caused by such high perchlorate concentrations and not from a specific mode of action unique to perchlorate.

Jordinson also notes that thyroid hormones in fish have been shown to vary depending on the stage of maturation of the gonads and whether spawning is occurring, indicating links between the thyroid gland and the reproductive system. Thyroid receptors have also been found on the gonads of some species. "It is therefore possible that the reproductive effects [of perchlorate] could be

due to disruption of the thyroid system in the sticklebacks," she says.

The lowest perchlorate dose in the experiments was more than 1,000 times higher than the EPA's suggested limit of 24.5 ppb for perchlorate in drinking water. Bernhardt says that the concentrations are lower than groundwater concentrations at several contaminated sites in the United States. Perchlorate has been found at ppb levels in drinking water, whereas concentrations reported in food vary from low ppb concentrations to highs of several ppb.

Next Bernhardt plans to study sticklebacks' dose response to perchlorate with the help of a glycoprotein glue called spiggin. During the breeding season, males produce spiggin for use in building their nests. Just as researchers use the protein vitellogenin as a biomarker for feminizing effects, Bernhardt and colleagues plan to use spiggin as a marker for masculinization. —Rebecca Renner



Failure to shine. Male threespine sticklebacks normally undergo a dramatic color change (top) to signal readiness to spawn. Perchlorate-treated male fish (above) failed to "color up," ignored females, and displayed no courtship behaviors.

Lower Prevalence of Breast Cancer Gene Mutations

Approximately 200,000 women are diagnosed with breast cancer each year. A paper in the 15 August 2006 issue of *Cancer Research* now gives the clearest picture to date of how many people in the United States carry mutations in the two dominant "breast cancer genes," *BRCA1* and *BRCA2*. The authors wrote that 2.4% of the breast cancer patients in their study had *BRCA1* mutations, whereas 2.3% had *BRCA2* mutations. They also found that among white and black women aged 35 to 64 in the general population, the prevalence of *BRCA1* mutations is 0.06% and that of *BRCA2* mutations is 0.4%. The results are largely compatible with earlier estimates. Germline mutations in these genes are associated with a 26–84% lifetime risk of breast cancer and a 10–50% lifetime risk of ovarian cancer.



The End of "Asthma"?

The term "asthma," probably first used medically by Hippocrates, comes from the Greek for "panting." Now an editorial in the 16 August 2006 issue of *The Lancet* has called for the scientific community to abandon this term, stating that asthma is not a single disease, but a group of syndromes with different causes and characteristics. The editorial suggests that asthma may actually be only a symptom of several distinct diseases, similar to fever. Currently, an estimated 300 million people in the world have asthma symptoms, and 100 million more are expected to suffer from the condition by the year 2025.

Got Kenaf?

The market for recyclable materials in Europe is growing, with this year seeing the enactment of a law requiring that all new cars be 85% recyclable.

One project that looks to capitalize on this trend is a new manufacturing complex in Spain launched by the UK company SPDG, with \$2.51 million provided by the Spanish government and another possible \$1.65 million coming from regional governments. The complex, with construction set to begin this year, will manufacture products based on the towering, hibiscus-like plant kenaf. The complex should be able to process 10,000 metric tons of locally grown kenaf each year into recyclable items to replace glass-reinforced plastics and fiberglass in construction, automobiles, and electronics.



RESEARCH ISSUES

A Question of Balance

Expert committees convened by the National Academy of Sciences (NAS) have long advised the U.S. government and the public on challenging technical issues. But are those committees fair and balanced in their views? Perhaps not, according to the Center for Science in the Public Interest (CSPI), a Washington, DC-based advocacy group. In an investigation spanning two and a half years, the CSPI reviewed 21 NAS committees and concluded that one in five of their members had direct ties to industries with a stake in study outcomes. The group reports its findings in *Ensuring Independence and Objectivity at the National Academies*, released 24 July 2006.

Merrill Goozner, director of CSPI's Integrity in Science Project and a coauthor of the report, acknowledges the investigation could find no evidence showing that NAS conclusions were adulterated by industry affiliations. "Nevertheless," he says, "the report raises an important question: do industry ties make committees less bold with respect to their conclusions than they might be otherwise?"

CSPI's conclusions hinge on its controversial definition of "conflict of interest," described in the report as "a financial tie within the last five years to a company or industry that is relevant to a committee topic." Of 320 experts reviewed by CSPI, at least 56 had conflicts meeting that criterion, while 66 had a history of espousing what the authors call "pro-industry" positions in research papers or legal

testimony. Nine experts were closely aligned with nonprofit environmental or public-interest organizations.

The NAS responds that, if applied, CSPI's conflict-of-interest definition would make it nearly impossible to recruit qualified experts for committee membership. Spokesman Bill Kearney says the NAS merely considers whether experts or their immediate relations or business partners have *current* financial interests that might be directly affected by the committee's work. Previous ties to industry—or to any other interest—don't influence the selection, he says, unless they reveal a distinct bias towards a particular view, which can be balanced by adding someone with an opposing view to the committee.

"We disagree with CSPI's definition," Kearney says. "It excludes people who in our opinion don't have a financial stake in the outcome of a study." Kearney also stresses that the NAS's conflict-of-interest screens comply with the Federal Advisory Committee Act.

Dan Greenbaum, president of the private Health Effects Institute, serves on the NAS Board on Environmental Studies and Toxicology, and has also participated in expert committees on air quality. He warns that CSPI's more stringent criteria could exclude some outstanding and impartial scientists, and that fuller public disclosure could raise issues of privacy. But he adds that the report serves a useful purpose by pushing for conflict-of-interest data at earlier stages in the selection process. "CSPI is helping to move that agenda forward," he says. "They've made the academy nervous and at times understandably upset . . . but they've also brought in a level of scrutiny that advances the process." —**Charles W. Schmidt**

GLOBAL WARMING

Clinton Climate Initiative Heats Up

Given that metropolitan areas account for more than 75% of the world's greenhouse gas (GHG) emissions, it is only right that cities should lead the effort to stem such emissions. To this end, the William J. Clinton Foundation has partnered with the Large Cities Climate Leadership Group to launch the Clinton Climate Initiative (CCI). "The partnership . . . will take practical, and most importantly, measurable steps toward helping to slow down global warming, and by taking this approach I think we can make a big difference," Clinton said at the CCI's launch.

The first CCI project will create a purchasing consortium that will allow participating cities to save money on buying and developing energy-saving products and measures. Each member city will also use a web-based communication system and measurement tools created through the CCI to establish a baseline of its GHG emissions and report on progress as changes are implemented. Already, 24 of the world's largest cities have pledged to support the voluntary effort, and many more have been invited to join.



Men of action. Former president Bill Clinton and London mayor Ken Livingstone (seated, left to right) sign the memorandum of understanding to launch the Clinton Climate Initiative. Joining them (standing, left to right) were British prime minister Tony Blair, Los Angeles mayor Antonio Villaraigosa, and San Francisco mayor Gavin Newsom.

Global warming experts applaud the CCI's mitigation component, and see it as an integral first step in slowing the rate of global warming. Kristie Ebi, an independent consultant to UN agencies and others on climate and health issues, sees opportunity for the alliance to reduce GHG emissions in the next decade "by focusing on projects that increase energy efficiency, thus decreasing emissions from electric power generation." She also points to transportation as a prime area for innovation, since this sector accounts for about

one-third of all GHG emissions.

In the meantime, Ebi says, "Large cities also need to design and implement adaptation measures to reduce their [current] climate-related risks." Some cities might implement heat wave early warning systems, for example, while others would benefit from water conservation measures.

John Reilly, associate director for research of the Massachusetts Institute of Technology Joint Program on the Science and Policy of Global

Change, agrees: "Global warming is a result of the accumulation over many years of long-lived greenhouse gases. To have a tangible effect, an initiative must change emissions by a large amount and continue for decades." Not even the CCI will noticeably affect temperature change within the next 50 years, Reilly says, but "the only way we will get to the year 2100 and look back and say we have made a substantial difference is to start out with firm steps toward a less GHG-intensive world than we otherwise are headed on." —**Tanya Tillett**

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CHE Fertility Online Abstracts Library

A great deal of research is now being published on the effect of environmental chemicals on reproductive health and declines in fertility. The Fertility/Early Pregnancy Compromise Work Group of the Collaborative on Health and the Environment (CHE) is now working to assemble these reports in a searchable abstracts library. This resource was developed by CHE work group member Sarah Janssen along with Pete Myers of EnvironmentalHealthNews.org and Theo Colborn and colleagues at The Endocrine Disruption Exchange. The abstract library is available from a link at http://www.healthandenvironment.org/wg_fertility_news/652.

The Bolinas, California-based CHE was formed in the spring of 2002 as a project of the nonprofit health and environmental research institute Commonweal. Its mission is to promote knowledge about the increasing links between human health and environmental toxicants. CHE sponsors a number of work groups that focus on particular areas of concern. EnvironmentalHealthNews.org, meanwhile, is published by the nonprofit organization Environmental Health Sciences, which seeks

to help increase public understanding of emerging scientific links between health and the environment. The Endocrine Disruption Exchange seeks to gather, organize, and interpret scientific research relevant to endocrine disruptors.

The listings are updated daily; as of October 2006, the library contained more than 500 news stories, opinion pieces, and scientific studies from sources around the world. The items in the listing are arranged

chronologically and have links to the full text of the story when it is available for free.

Links at the side of the abstract listing allow visitors to find items by 1 of 12 options. The first option sorts the entries by article type. Next is a section of 12 Current Issues, which include air, cancer, children's health, climate change, environmental justice, environmental politics, GMO/bioengineering, hazardous products, reproductive disorders, sewage systems, sustainable business, and water. Following this is a list of 15 human health conditions, contamination agents, exposure pathways, and ecological effects.

Visitors can also search for items sorted by infrastructure (for example, food production or sewage systems), solutions (which encompasses activism, economics, environmental politics, laws, organizing principles, regulations, and sustainable business) and emerging science (including topics such as endocrine disruption and fetal programming). Finally, visitors can find items by area of coverage, publisher, and year of publication, with items dating back as far as 2002.

The library also provides a text search option, which scans all fields or just the title, article text, description, publisher, coverage, or subject. Visitors can add the list as an RSS or JavaScript feed.

As a companion resource, the CHE Fertility/Early Pregnancy Compromise Work Group also has brought together a catalogue of fertility-relevant news stories and organizational reports. This is available from a link on the same page as the abstracts library. Currently, there are more than 1,000 items available within this catalogue, which is set up the same as the abstracts library. —Erin E. Dooley



EU Rules Tough on Toys

The European Union's Restriction of Hazardous Substances directive, which took effect 1 July 2006, bans lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers in a wide range of electrical and electronic products—and also bans products that are found to contain these materials. One group that is being hit especially hard by this new policy is Chinese toy makers. In 2005, China exported \$15.18 billion worth of toys, including nearly 80% of the toys imported by Europe. Industry experts say the directive will drive manufacturing costs up by at least 20%. The cost of alternative raw materials, now high in demand, is one factor; another is the cost of compliance certification.



Clean Air Institute Takes Flight in Latin America

Latin America has 133 cities with populations of more than 500,000. In these cities, transportation is the leading cause of air pollution, which is linked with significant health impacts. In Santiago, Chile, alone, 4,000 premature deaths are linked to air pollution each year. In July 2006, the World Bank announced the creation of the nonprofit Clean Air Institute to manage the Clean Air Initiative for Latin American Cities. This initiative is a coalition of cities, private entities, and NGOs joining together to exchange information on air quality programs. The institute's main responsibilities include acting as a forum for strategy and project development, and as a center for training and technical assistance.

Overweight People Now Outnumber the Hungry

With the WHO characterizing obesity as one of the greatest public health challenges of the 21st century, it was announced at the August 2006 meeting of the International Association of Agricultural Economists that the number of overweight people in the world has surpassed the number of malnourished for the first time. Current estimates place the number of overweight or obese people at 1 billion and the number of people without enough to eat at about 800 million, says nutritionist Barry Popkin of the University of North Carolina at Chapel Hill. Though the number of hungry people is falling gradually, the number of obese people is growing rapidly. Popkin suggested that governments should subsidize the production of fruits and vegetables and enact higher taxes on sugary items to help stem the rise in obesity.

